

MODIS IOT Weekly Report

Mission Operations Days: 2001/174 to 2001/180

June 22, 2001 20:00:00 GMT to June 29, 2001 20:00:00 GMT

The MODIS Power Supply 2 Shut Off on DOY 2001/166. (details below)

MODIS is currently in Survival Mode.

MODIS is currently NOT producing Science Data.

Attempted MODIS turn ON, PS1/CPB failed (see below).

Terra Spacecraft and MODIS Instrument Status:

Terra (AM-1) is in Normal Mode

MODIS is in Survival Mode

Blackbody	A Off; B Off	PS2 Shutdown Anomaly
Calibration Electronics	A Off; B Off	PS2 Shutdown Anomaly
Control Processor	A Off; B Off	PS2 Shutdown Anomaly
Door: Nadir	Unlatched, open	Nominal
Space View	Unlatched, open	Nominal
Solar Diffuser	Unlatched, closed	Nominal
FDDI Formatter	A Off; B Off	PS2 Shutdown Anomaly
FDDI Port	A Off; B Off	PS2 Shutdown Anomaly
FIFO Memory	1 & 2 Off; 3 & 4 Off	PS2 Shutdown Anomaly
Format Processor	A Off; B Off	PS2 Shutdown Anomaly
Power Supply: 1	Off	PS2 Shutdown Anomaly
2	Off	PS2 Shutdown Anomaly
PV FPAs: VIS	A Off; B Off	PS2 Shutdown Anomaly
NIR	A Off; B Off	PS2 Shutdown Anomaly
SMIR	A Off; B Off	PS2 Shutdown Anomaly
LWIR	A Off; B Off	PS2 Shutdown Anomaly
PC FPA: LWIR	A Off; B Off	PS2 Shutdown Anomaly
Radiative Cooler:		
Outgas Heaters	All Off	Nominal
LWIR FPA Heater	Off	PS2 Shutdown Anomaly
SMIR FPA Heater	Off	PS2 Shutdown Anomaly
Scan Assembly	A Off; B Off	PS2 Shutdown Anomaly
SDSM	Off	PS2 Shutdown Anomaly
SRCA	Off	PS2 Shutdown Anomaly
Survival Heaters: PS1	Enabled	Nominal
PS2	Enabled	Nominal
Timing Generator	A Off; B Off	PS2 Shutdown Anomaly
Flight Software	Rev BD	PS2 Shutdown Anomaly

Inhibit Ids Set	None	PS2 Shutdown Anomaly
TMONs enabled	None	PS2 Shutdown Anomaly

This Week's Completed MODIS Activities:

Saturday, June 23, 2001
None

Sunday, June 24, 2001
None

Monday, June 25, 2001
None

Tuesday, June 26, 2001
None

Wednesday, June 27, 2001
None

Thursday, June 28, 2001
179/18:59:30 – 19:03:14 RealTime MODIS was turned on using PS1 and CPB.
1553 bus stops sending telemetry and some unexpected currents are received.
179/19:04:07 – 19:09:00 RealTime MODIS is powered OFF

Friday, June 29, 2001
None

This Week's Scheduled MODIS Activities Not Completed:

None

Upcoming MODIS Events:

No events will be scheduled until PS2 Shut Off Anomaly is resolved.

Saturday, June 30, 2001
None

Sunday, July 1, 2001
None

Monday, July 2, 2001
None

Tuesday, July 3, 2001
None

Wednesday, July 4, 2001
None

Thursday, July 5, 2001
None

Friday, July 6, 2001
None

Maneuvers:

The Drag Makeup Maneuver occurred on day 178 at 1905 GMT. It was a 16 second duration burn. The loss and re-acquisition of pointing accuracy period was 178/1735 – 178/2035.

The next MODIS Lunar Roll Calibration is scheduled for DOY 191 from 15:07:42 to 15:14:12. This roll has the obvious prerequisite that MODIS must successfully from its Power Supply 2 Anomaly (described below).

MODIS Anomalies:

On June 15th, 2001, at 03:56:08 GMT, MODIS experienced an anomaly.

The Flight Operations Team paged the on-call MODIS engineer reporting a trip of TMON #68 (autonomous Telemetry Monitoring software on the spacecraft). TMON #68 is the MODIS double FIFO (First In, First Out data buffer) Write State TMON. In addition, many red limit violations were reported. Inspection of telemetry showed peculiar states including a CP (Control Processor) mode of INVALID and the MODIS model as ENGINEERING. With all telemetry suspect, the MODIS IOT commanded the instrument to low-power mode (using procedure MOD_ALL_OFF) at 05:16:43.

Investigation is still pending, but below is the current understanding of the event:

Continued telemetry analysis showed that the TMON itself did not trip, but rather, it went into an error state because it was receiving stale telemetry. At the anomaly time, all telemetry “pegged out”, and the telemetry headers stopped incrementing (thus explaining the error reported by the TMON).

Science data stopped being recorded on the SSR at the same time the housekeeping telemetry “pegged out”. This suggests that it was NOT a 1553 Bus communication problem between MODIS and the spacecraft, but rather something that would affect both housekeeping and science data.

At the time of the anomaly, the EPS feed current to MODIS (an external spacecraft point) dropped from ~1.5 Amps to 0.07 Amps suggesting that all MODIS components, with the exception of the power supply, powered down at that time.

ANOMALY REVIEW TEAM UPDATE:

At this time, the evidence is very strong that a failure has occurred in PS2 and that the rest of the instrument is okay. There is still the question about whether the failure was a soft failure or a hard failure. If the failure was a hard failure (such as an electrical short), it is possible that powering up PS2 could possibly stress the loads (those components still internally enabled on MODIS from the time of the PS2 shut off) with an over voltage. However, if the failure was a soft failure (such as a Single Event Upset (SEU) caused by a high-energy particle impact), it is possible that powering up PS2 will return it to full operational capability.

WHEN instrument commanding begins for the recovery effort, the electronics will be very cold. The use of Telemetry and Command Processor B (known as TCP B or CP B) would minimize any chance of command processor resets due to the cold (which CP A has a tested history of experiencing).

RECOVERY ATTEMPT

On June 28th (day of year 179), at 18:59:30, MODIS was powered on using power supply 1 (PS1) and control processor B (CPB). The 1553 bus stopped sending telemetry, and at the time, there were questions about the current values. At 19:09:00, the MOD_ALL_OFF procedure was executed and MODIS was again turned OFF.

General Instrument Comments:

MODIS is currently powered off in Survival Mode. The Survival Heaters are cycling as expected. Return to an operational mode is currently pending the outcome of the MODIS Power Supply 2 Anomaly.

MODIS Telemetry Trends:

Voltage, current and temperature trending over the previous month, in addition to selected past time periods is currently underway to support the resolution of the MODIS Power Supply 2 Shut Down Anomaly.

Non-MODIS Significant Events:

SSR Anomaly:

Late in the evening of June 16, 2001, the Solid State Recorder (SSR) locked up. The SSR was no longer recording data and was not responding to commands uplinked by the Terra Flight Operations Team (FOT) to dump its data. This made it impossible for the ground to acquire any recorded housekeeping telemetry or science data from the Terra spacecraft.

Because housekeeping data could not be dumped, the health of Terra in the “back orbit” (periods outside of direct contact with the spacecraft) was unknown. A spacecraft emergency was declared and near-contiguous real-time TDRSS contacts were scheduled.

The SSR was placed into “Low Power Mode” and its telemetry was analyzed. The decision was made to power up and re-cycle the SSR on June 17th. At 23:13 GMT on June 17, 2001, the SSR successfully dumped housekeeping data. This confirmed the suspicion that the SSR had experienced a multi-buffer lockup across all of its supersets, similar to what had been experienced previously in ground tests and approximately 1 month after launch in January of 2000.

After further testing and analysis, the SSR was restored to full operations (successfully dumping science data) at 11:40:34 GMT on June 20, 2001.

Any interesting byproduct of this event was the functional restoration of supersets 30 and 31 (which, after reallocation of the supersets, they now reside in the MISR buffer). Additionally, ASTER’s superset allocation was reduced by one superset to solve a complication with replays of their science data. This free superset has been allocated to the MODIS buffer. With the restoration of the malfunctioning supersets (which are no longer allocated to the MODIS buffer), and the additional superset, MODIS will have approximately 3% greater science data storage space than originally allocated.

MOPITT Anomaly:

On day 179, the MOPITT instrument was successfully powered on and is currently taking science data.

Limited Life Item Status:

SRCA 10W Lamp #1: 186.1 of 500 hours
SRCA 10W Lamp #2: 143.0 of 500 hours
SRCA 10W Lamp #3: 152.2 of 500 hours
SRCA 10W Lamp #4: 61.5 of 500 hours

SRCA 1W Lamp #1: 557.6 of 4000 hours
SRCA 1W Lamp #2: 276.3 of 4000 hours

Solar Diffuser Door: 1633 of 3022 Movements
Nadir Aperture Door: 532 of 1316 Movements
Space View Door: 437 of 1316 Movements